Title	<ELCAS 活動報告>Study on dugongs' vocalization
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Citation	ELCAS Journal (2018), 3: 109-110
Issue Date	2018-03
URL	http://hdl.handle.net/2433/230606
Right	
Type	Journal Article
Textversion	publisher

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Study on dugongs' vocalization

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In the beginning, when I first heard the subject of dugongs, whose voice was available in our research in the science workshop, I was reminded of the famous SF novel by Verne, *Twenty Thousand Leagues Under the Sea*. Written in the seventeenth century, dugongs had been described as a kind of animal that was rare 400 years ago. I had not hesitated to select this project because that I was interested in marine mammals.

Backgrounds

About dugongs (*Dugong dugon*)

①The size of an adult dugong is 3 m long and 350 kg in weight on average.

②Habitats of dugongs are shallow waters from tropical to semi–tropical areas. The biggest habitat in the world is in north Australia where about 70000 dugongs live. The northern limit of their habitat is Okinawa, Japan, and two or three dugongs are currently found to live there.

③The communication skills of dugongs are very interesting, and researchers are attracted to this. There are two majority sounds as the means of communication for dugongs: chirps and trills. Using chirps, dugongs attract other dugong's attention, and just like that, we say hello to each other; using trills, they send messages about their sensations. Trills are defined as vocals constitutively at more than 300 ms.

④Dugong calves will be taken care of by the mother for more than 18 months.

Purposes

Vocal samples of dugongs, which were recorded in the various habitats, are analyzed in this research. The purpose is to find out if there are any differences in sound depending on the habitats. It is well known that killer whales have dialects, but there is no evidence that dugongs have a dialect. If dugongs have a dialect, it will help us investigate their social habitats.

Samples and Methods

(1) Samples are kindly prepared by Dr. Ichikawa. These samples were collected from three different habitats:

①In the Malaysian waters in Johor (2015/09/06 18:14:20): about 150 Malaysian adult dugongs live in the area.

②In the Andaman sea (2002/02/22 05:33:03): about two Thailand adults dugongs live in this area.

③A captive calf in Thailand (2004/03/06 15:05:20): P–Chan, a calf protected in a shelter, who lost its mother and was discovered on a beach.

(2) Methods of collecting vocal samples from dugongs

Since dugongs live under the sea, it is inconvenient to observe them from boats or on land.Acoustic monitoring of currents is usually selected, which is a well–known method of analyzing records of sound samples. These sounds were recorded by special microphones. This time, the microphones had been set on the sea floor to monitor and record the vocalization of dugongs.

(3) Analysis means

First, Audacity software was used to find chirps and trills. Next, the duration, dominant frequency, and sound pressure level (SPL) were measured. Last, all the data were fed into Excel and analyzed them by R software and then displayed as graphs.

Results

(1) Dugongs in Malaysia

·There were many trills: 22.

·The frequency was at a high level.

Malaysia	Duration (ms)	Frequency (Hz)	SPL (dB)
Min	142.0	3247	–47.20
1stQU	180.0	4248	–45.58
Median	205.0	4588	–44.10
Mean	596.3	6465	–43.42
3rdQU	1037.2	8926	–41.75
Max	2272.0	12243	–36.50

(2) Dugongs in Thailand

·Trills were heard only three times, and the duration was relatively short.

The frequency was the lowest among the samples.

Thailand	Duration (ms)	Frequency (Hz)	SPL (dB)
Min	82	1897	–56.80
1stQU	113	2699	–42.90
Median	139	2970	–38.50
Mean	232.8	3766	–39.05
3rdQU	167	6304	–33.70
Max	2387	7187	–28.80

(3) Juvenile P–chan in Thailand

·Most vocalizations were chirps, and trills were rare.

The intervals between two chirps were very short.

·High frequencies were usually found in the samples.

·The SPL was highest among these three samples.

Pchan	Duration (ms)	Frequency (Hz)	SPL (dB)
Min	55.0	2804	–46.60
1stQU	90.0	4184	–27.32
Median	126.0	4262	–22.70
Mean	129.2	6676	–22.86
3rdQU	164.0	7998	–17.30
Max	279.0	17721	–10.20

Discussion

1. Comparison of adult dugongs living in different habitats

   As is described in the background, trills are used to communicate sensations to each other. Based on the results, it was shown that the number of trills depended on the number of dugongs living together. The number of dugongs living in Thailand was only two adults; therefore, trills appeared only three times, which was fewer times than Malaysian dugongs. Conversely, there were many adult Malaysian dugongs, so there were more trills recorded in those samples.

2. Comparison of adults and calves

   Because this calf dugong was not with its mother, the calf communicated in chirps. This action was seen as the calf calling for its mother. This is a special case, and normal calf behavior should be observed in the future. For this research, there were differences in the frequency of sounds when comparing the calf to an adult. So it is suggested that there is a change in the vocalization according to the maturation of the calf as it grows. As shown in result 3, the SPL values were the highest in these groups. Probably, the reason is that the calf was protected by humans and near the acoustic monitoring and the microphone.

Conclusions

Above all, there are differences between Malaysian dugongs and Thailand dugongs in the frequency and use of trills. These will be studied whether it is a dialect or not. Also, there are differences between calves and adults when comparing the frequency of vocalizations and the purpose of the vocalizations. The implication is that the dugongs use vocalizations depending on the situation, the community, and the stage of growth. Further analysis is pursued for the baby growing course. In the future, it is possible to clarify the reason for the extinction of dugongs, and all these data will help us to set up some safety measures, which could save dugongs from extinction.

Acknowledgements

I would like to thank all the people who gave me the chance to participate in this research, especially Dr. Arai, Dr. Ichikawa, Dr. Kimura, Mr. Uehara, Mr. Seko, and Ms. Sakai from the Kyoto University, Field Science Education and Research Center for their kind instruction during the project. Also, it was very nice that all staff members and teachers supported us in the Science Workshop. Thank you so much!

Reference

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